## REMARKS

Claims 1-21 are now pending in the application. Minor amendments have been made to the specification to simply overcome the objections to the specification and rejections of the claims under 35 U.S.C. § 112. The Examiner is respectfully requested to reconsider and withdraw the rejection(s) in view of the amendments and remarks contained herein.

## DRAWINGS

Applicants have amended FIG. 2A to include reference number 53 to identify central portions between slits 50 and 52. Applicants have added windings 24 and insulation material 77 to FIG. 2A. Applicants have added FIG. 2C to illustrate the deformed central portions 53. No new matter has been entered by either of the changes as the central portions were described in Paragraph [0038] of the application and the insulation material is described in Paragraph [0043].

Applicants have amended FIG. 5A to identify the stator plates 26 that form a stack in the stator segment core 20 as described in Paragraph [0038]. No new matter has been entered by these amendments.

## DOUBLE PATENTING

Applicants respectfully submit that the rejection of claims 1-21 under the judicially created doctrine of double patenting in not ripe. None of the claims of either application (Serial Nos. 09/803,876 or 09/817,559) have been patented. When this issue becomes ripe, Applicants may consider filing a terminal disclaimer.

## REJECTION UNDER 35 U.S.C. § 112

Applicants traverse the rejection of Claim 7 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point and distinctly claim the subject matter which Applicants regard as the invention.

In the specification in Paragraph [0038], Applicants described the central portion and how the central portions releasably interconnect the stator plates of the stator core:

> The stator plates 26 are die cut from thin sheets of magnetically conductive material. During the die cutting operation, a first pair of slits 50 are cut into the outer rim section 28 and a second pair of slits 52 are cut into the pole section 30. The slits 50 are transverse in alignment relative to the slits 52. After stacking the stator plates 26 that form the stator segment core 20, a die punch operation is completed to deform a central portion 53 between the slits 50 and 52. This operation results in the stator plates 26 being releasably interconnected to define the stator segment core 20.

The stator plates 26 are stacked. A die punch operation is performed to deform the central portions 53 between the slits 50 and 52.

When the die punch impacts the central portions 53 (for example on an outer stator plate 26) between the slits 50 and 52, all of the central portions 53 deform from a planar shape into an non-planar or arc shape now shown in FIG. 2C. The deformed central portion 53 between one pair of slits 50 of the bottom stator plate 26 is received between the slits 50 of a second adjacent stator plate 26 in the stack. The deformed central portion 53 between one pair of slits 50 of the second stator plate 26 is received between the slits 50 of a third adjacent stator plate 26 in the stack. This interlocking arrangement continues for the remaining stator plates in the stack.

In addition, the deformed central portion 53 between one pair of slits 52 of a first or bottom stator plate 26 is received between the slits 52 of a second adjacent stator plate 26 in the stack. The deformed central portion 53 between one pair of slits 52 of the second stator plate 26 is received between the slits 52 of a third adjacent stator plate 26 in the stack. This interlocking arrangement continues for the remaining stator plates in the stack.

The slits 50 and 52 are transverse in alignment. Therefore, deformed central portions provide support in two directions.

Applicants believe that the rejection under § 112 is not moot.

**REJECTION UNDER 35 U.S.C. § 103**

Applicants traverse the rejection of Claims 1-5, 8-13, 16-18 and 21 under 35 U.S.C. § 103(a) as being unpatentable over Tang (U.S. Pat. No. 5,811,905) in view of Takeuchi et al. (U.S. Pat. No. 5,583,387).

Regarding Claims 1, 9 and 16, Tang does not show, teach or suggest a stator including a plurality of circumferentially-segmented stator segment assemblies. Takeuchi et al does not show, teach or suggest a switched reluctance electric machine wherein the rotor tends to rotate relative to the stator to maximize the inductance of an energized winding.

Tang shows a switched reluctance machine with a stator core. The Examiner admits that there is no teaching or suggestion in Tang for segmenting the stator of the switched reluctance machine.

Takeuchi et al. teaches a segmented stator but does not disclose a switched reluctance electric machine.

In making the combination, the Examiner asserts that the combination would be made "for the purpose of increasing efficiency of a motor." In particular, Takeuchi et al. employs a segmented stator to increase slot fill from 52-55% to 70%. Col. 1, lines 19-25, and Col. 3, lines 43-45.

The facts in this case are contrary to the Examiner's assertion that it would be obvious to combine the references. Despite the existence of the two separate teachings for over 50 years (as described below), no one has made the combination. If the combination is obvious, then why has it not been done?

For over 160 years, machine designers have employed a non-segmented stator in switched reluctance machines. One of the earliest recorded switched reluctance motors was built by Davidson in Scotland in 1838. "Switched Reluctance Motors and their Control", T. J. E. Miller (Magna Physics Publishing 1993), p. 5 (attached hereto).

Non-segmented stators in switched reluctance machines continued to be used for over 50 years after the use of segmented stators in other types of electric machines. Sheldon (U.S. Patent No. 2,688,103, which was issued in 1952) teaches a segmented stator for an electric machine to improve the efficiency of the electric machine (Col. 1, lines 17-24), but does not disclose the use of the segmented stator in a switched reluctance machine.

Neither the Examiner nor Applicants are able to identify any examples of switched reluctance machines with a segmented stator. This may be due to one of the

key advantages of switched reluctance motors ~ simple construction. In the Introduction of "Switched Reluctance Motors and their Control", Miller states:

> The geometry [of the switched reluctance motor] is beguilingly simple, and everything about the motor and its control seems at first sight to be a gift to the production engineer. Yet the attainment of good designs and satisfactory performance is practically impossible by traditional design methods.

See Introduction attached hereto. Segmenting the stator clearly increases the complexity of the design, which is counter to one of the primary reasons for using switched reluctance machines in the first place.

Based on the foregoing, it is clear that the conventional wisdom is to use non-segmented stators when designing switched reluctance machines. Proceeding against the conventional wisdom is evidence of nonobviousness. Arkie Lures Inc. v. Gene Larew Tackle, Inc., 43 USPQ2d 1294, 1297 (Fed.Cir. 1997); In re Hedges, 783 F.2d 1038, 1041, 228 USPQ 685, 687 (Fed. Cir. 1986). Here, Applicants have made the construction of the switched reluctance motor more complex by segmenting the stator. The geometry is no longer "beguilingly simple".

While improved slot fill is achieved by segmenting the stator, the primary motivation for segmenting the stator was to improve manufacturing tolerances and the electrical characteristics of the switched reluctance machine. The unconventional approach allowed Applicants to overcome the "practically impossible" task of obtaining satisfactory performance while being cost competitive in the marketplace. There is no teaching or suggestion in any of the references that segmenting the stator would improve the electrical characteristics of the stator and provide more robust sensorless rotor position sensing.

Switched reluctance machines selectively energize one set of phase windings to produce output torque. A controller connected to the switched reluctance machine requires a rotor position signal to energize of the phase windings at the correct time. The rotor position signal can be generated using a rotor position transducer or using a sensorless approach. Because the cost of rotor position transducers generally places switched reluctance machines at a competitive disadvantage with respect to other types of machines, commercial applications have attempted to use the sensorless approach.

Segmenting the stator in a switched reluctance machine provides results that are unique to switched reluctance machines. Namely, segmenting the stator allows the windings to be positioned far more accurately, which improves the resistance and inductance characteristics of the stator teeth. **See specification Paragraph [0049].** As a result, sensorless operation can be employed more effectively, which lowers the cost of the switched reluctance machine. The improved manufacturing tolerances allow less costly drive circuits and/or more accurate control of the switched reluctance machine.

For the foregoing reasons, Applicants respectfully assert that claims 1, 9 and 16 are allowable. The remaining claims are either directly or indirectly dependent upon claims 1, 9 and 16 and are allowable for the reasons set forth above.

## CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is

believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1211.

Respectfully submitted,

Dated: August 2, 2002

By: Michael D. Wiggins
Michael D. Wiggins
Reg. No. 34,754

HARNESS, DICKEY & PIERCE, P.L.C.
P.O. Box 828
Bloomfield Hills, Michigan 48303
(248) 641-1600